

# Spatial Power Combining Amplifier for W-Band Radar for Earth and Planetary Science (SPCA)

Completed Technology Project (2016 - 2018)



## Project Introduction

We are designing and building a new type of millimeter-wave high power amplifier, that will enable Watt-class to tens-of-Watt-class transmitter sources at W-Band (75-110 GHz, including 94 GHz). Having compact high power W-band sources in the 2-30 Watt range could enable a new science and engineering instruments, for Cloud radar and Landing radar.

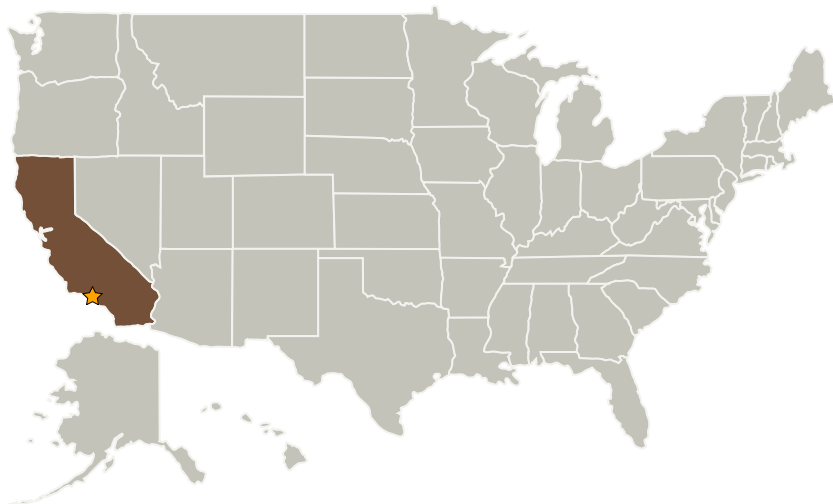
This work is developing a spatial-power-combining scheme using electromagnetic cavities and GaN MMIC chips, scaled up by a factor of 40 in frequency from prior art to make a highly compact, efficient W-Band power amplifier, in the 2-10 Watt power range.

## Anticipated Benefits

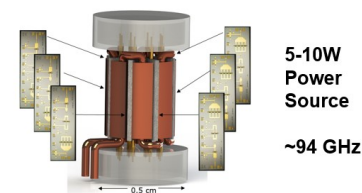
A new cloud radar using this compact power amplifier, capable of fitting on a small satellite (aka CloudCube, a counterpart to RainCube), would enable cloud radar science in a compact, efficient package, for the next generation of low-cost, low-mass Earth science instruments for spacecraft in the 25-50 kg class. Enables W-Band landing radar in low dust environment.

Defense and homeland security could benefit from the high power GaN source that we develop at W-Band (millimeter-wave imaging, crowd control, automotive radar).

## Primary U.S. Work Locations and Key Partners



*Miniature Spatial Power Combined Amplifier*



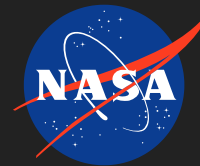
Miniature spatial power combined amplifier.

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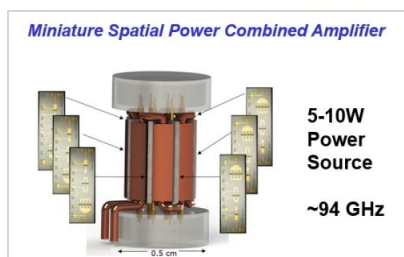


Organizations Performing Work	Role	Type	Location
★ Jet Propulsion Laboratory (JPL)	Lead Organization	NASA Center	Pasadena, California

## Primary U.S. Work Locations

California

## Images



## JPL\_IRAD\_Activities Project Image

Miniature spatial power combined amplifier.

(<https://techport.nasa.gov/image/27870>)

## Organizational Responsibility

### Responsible Mission Directorate:

Mission Support Directorate (MSD)

### Lead Center / Facility:

Jet Propulsion Laboratory (JPL)

### Responsible Program:

Center Independent Research & Development: JPL IRAD

## Project Management

### Program Manager:

Fred Y Hadaegh

### Project Manager:

Fred Y Hadaegh

### Principal Investigator:

Lorene A Samoska

### Co-Investigators:

Andy Fung  
Simone Tanelli  
Jose E Velazco  
Mark Taylor

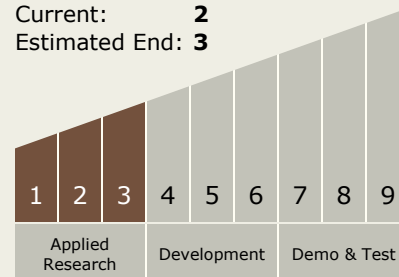
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## Technology Maturity (TRL)

Start: **1**  
Current: **2**  
Estimated End: **3**



## Technology Areas

### Primary:

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
    - └ TX08.1.4 Microwave, Millimeter-, and Submillimeter-Waves

## Target Destinations

Foundational Knowledge, Earth

## Supported Mission

### Type

Push